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GB 1414742
GB 1398616
GB 703024
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(71) Applicants
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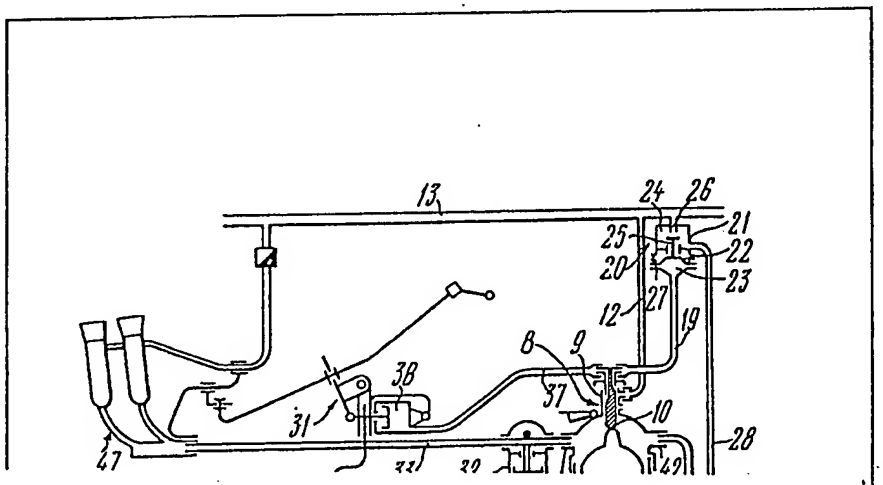
(54) Milking control device

(57) Apparatus for controlling the application and removal of milking apparatus 47 from a cow, includes a slide valve 8 communicating with atmosphere, with vacuum line 13 via line 12, and via line 19 with chamber 23 of a diaphragm valve 20 also communicating via duct 26 with vacuum line 13. The valve 8 thus controls the application of air and vacuum to chamber 23 of valve 20 and to pneumatic cylinders 29, 38 coupled to means 31 for manipulating the milking apparatus, and to a member 32 serving to open and close milk line 33. When evacuated, cylinder 38 acts to draw the milking apparatus downwardly and cylinder 29 causes the means 31 to rotate to swing the milking apparatus from under the cow. The valve 8 is acted on by a float 5 located in the housing 2 of a milk flow sensor 1, the float also carrying a needle valve member 6 cooperable with a gauged opening 4.



ERRATUM

SPECIFICATION NO 2050793A

Front page, heading (74) Agents *delete* A.A. Thornton & Co. *insert* Marks & Clerk

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27 February 1981

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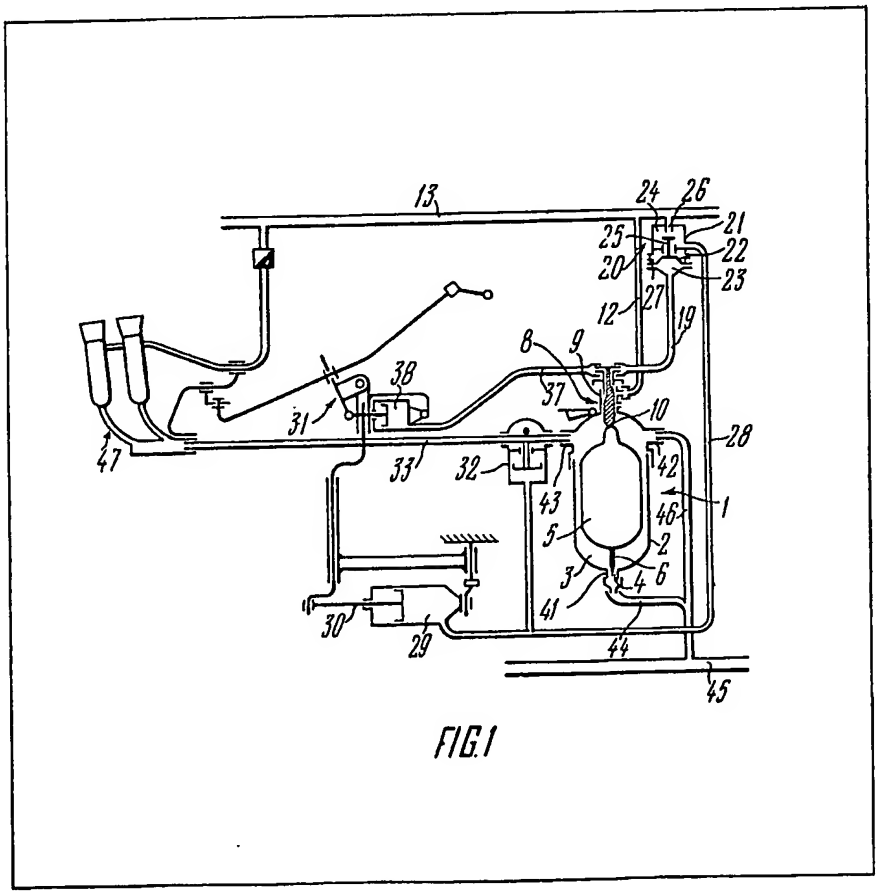

FIG.1

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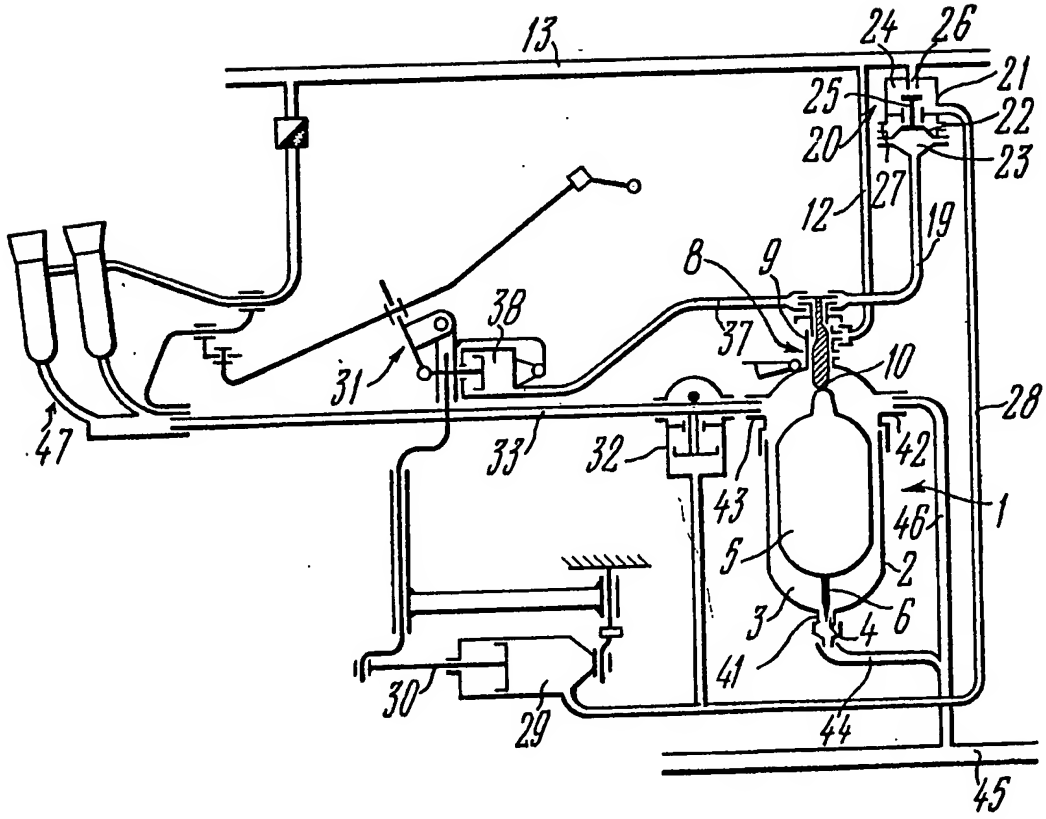
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FIG.1

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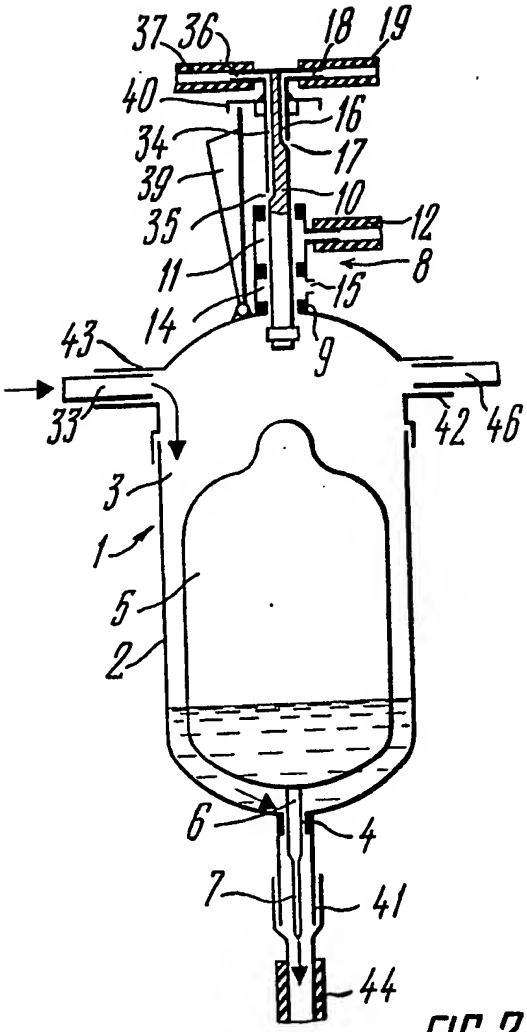

FIG. 2

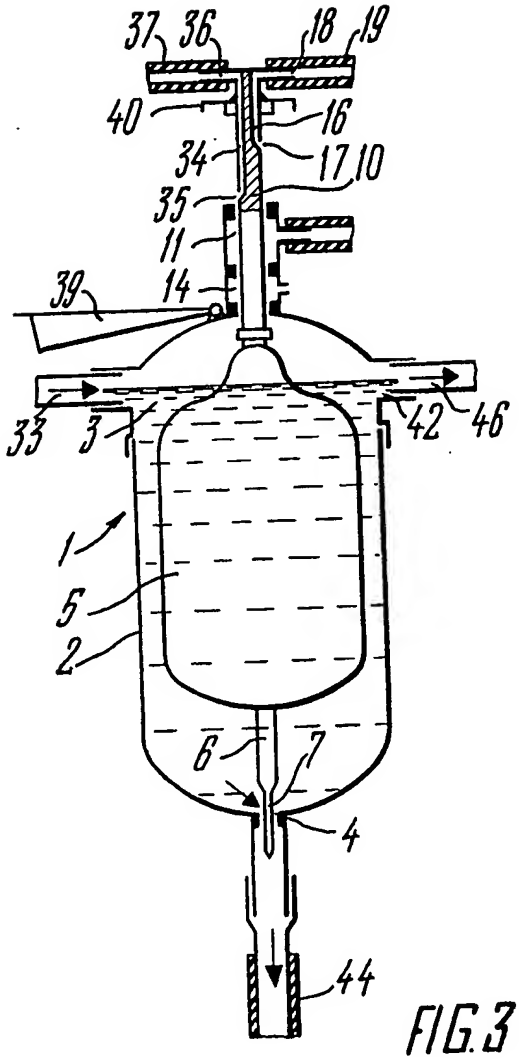

FIG. 3

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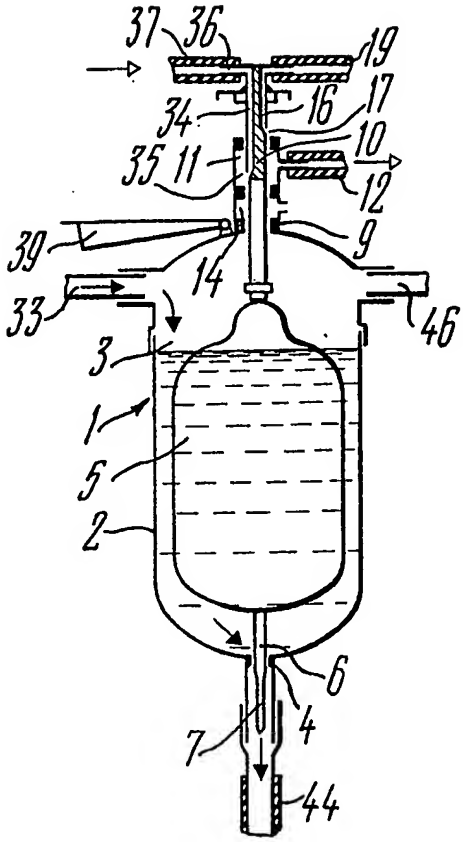

FIG.4

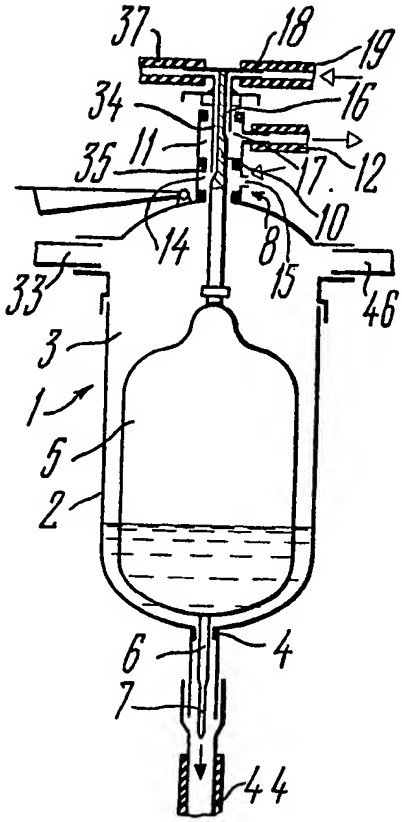

FIG.5

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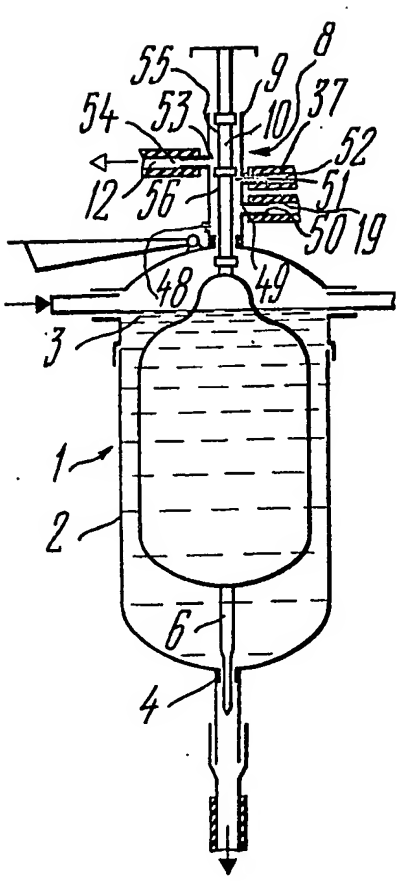

FIG.6

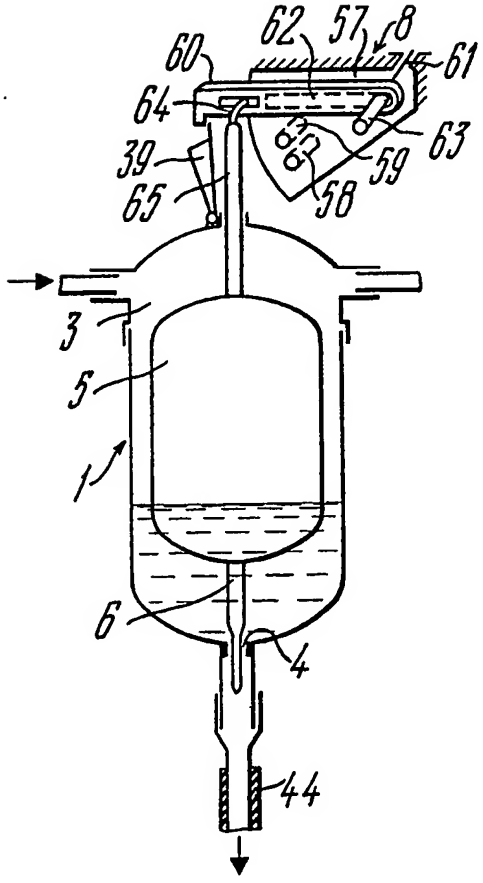

FIG.7

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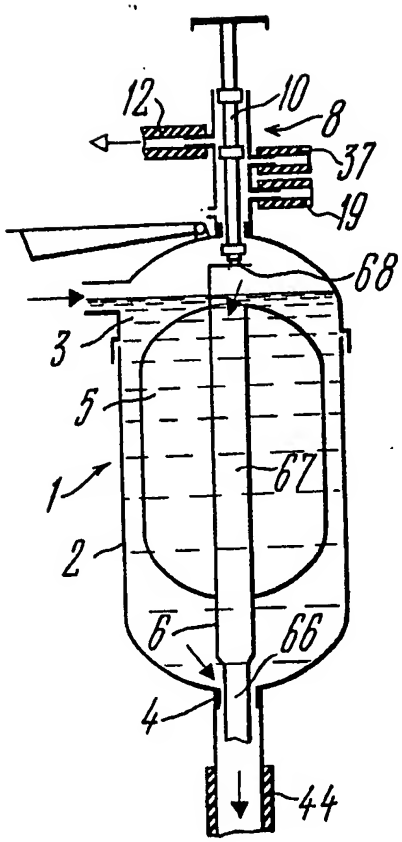

FIG.8

SPECIFICATION

Milking control device

The present invention relates to milking machines, and more particularly to milking control devices.

The present invention can be used to best of advantage in automatic milking machines.

The invention provides a milking control device comprising output elements controlling a milking apparatus, a milk flow sensor having a closed housing accommodating a float chamber provided, in its bottom portion, with an outflow aperture, and a float placed within said chamber, a means for communicating the output elements with an evacuating means or the atmosphere and capable of co-operating with the sensor, wherein, according to the invention, the outflow aperture is made gauged, a needle of a variable cross-section is secured on the bottom portion of the float, the needle having its end portion disposed in the outflow aperture, and the means for communicating the output elements with the evacuating means or atmosphere is shaped as a slide-valve air distributor mounted on the upper portion of the milk flow sensor housing, the spool of the air distributor being capable of co-operating with the float of said sensor.

With such a design it is becomes feasible to remove the fats and salts deposited on the edges of the outflow aperture and to dispense with electromechanical components and electric circuits. This results in a higher reliability and a simplier construction of the device.

It is advisable that the slide-valve air distributor have a hollow cylindrical shell provided with annular chambers, one of which communicates with the evacuating means and the other, with the atmosphere, aand a spool be shaped as a rod having, in its upper portion, longitudinal passages to communicate the annular chambers of the shell with the output elements.

It is also practicable that the slide valve air distributor have a hollow cylindrical shell provided with a group of openings made in the shell wall and located at different levels, the lowermost opening communicating the shell interior with the atmosphere, the uppermost one, with the evacuating means, and the rest, with the output elements, and a spool be shaped as a rod having annular recesses to communicate the openings in the shell with each other.

Slide-valve air distributors of such a design exhibit a high reliability and ensure that output elements to come into action in a proper succession.

It is expedient that the slide-valve air distributor comprise a vertically fixed plate and be provided with through passages communicated with the output elements, and a plane spool adjoining with its one side to the plate where it has a groove communicated with the evacuating means, the spool being pivoted with its one end to this plate, and with the other, to a rod secured on the float of the milk flow sensor.

Such a slide-valve air distributor is reliable in operation and simple in design.

It is practicable that the needle be made hollow and openended, with its upper end communicating with a tube passing through the float body.

Such a design makes the housing of the milk flow sensor simplier in design since it becomes possible to dispense with a duct for removal of the excessive milk from the interior of the housing.

It is also preferred that the device be provided with a self-collapsible dog to stop the spool of the air distributor in its uppermost position, the dog being co-operative with a clamp attached to the spool.

With the aid of the self-collapsible dog it becomes possible to communicate the output elements with the atmosphere in the beginning of milking when the float chamber of the milk flow sensor is empty, which takes some burden from the personnel.

The present invention will be more understood upon the consideration of the following preferred embodiments taken with reference to the accompanying drawings, in which:

Figure 1 is a schematic view of a milking control device coupled to a milking apparatus, according to the invention;

Figure 2 is a schematic view of a milk flow sensor equipped with a slide-valve air distributor, according to the invention, as in the beginning of milking when the spool is in its uppermost position;

Figure 3 is the same when the cow gives a full flow of milk and the float of the sensor is in its uppermost position;

Figure 4 is the same when the cow gives a decreased flow of milk and the float is in an intermediate position;

Figure 5 is the same when the cow ceases to give milk and the float is in its lowermost position;

Figure 6 is a milk flow sensor equipped with a slide-valve air distributor of another embodiment;

Figure 7 is a milk flow sensor equipped with a slide-valve air distributor of still another embodiment;

Figure 8 is a milk flow sensor having modified needle and float.

Referring to Figure 1, the milking control device comprises a milk flow sensor 1 having a closed housing 2 accommodating a float chamber 3 provided, in its bottom portion, with a gauged outflow aperture 4. Diseosed within the float chamber 3 is a float 5 bearing, in its lower portion, a needle 6. The end portion 7 of the needle is made of a variable cross-section namely the cross-sectional area increases towards the top of the end portion. The end portion 7 of the needle 6 enters the gauged aperture 4.

Mounted on the upper portion of the housing 2 of the milk flow sensor 1 is a slide-valve air distributor 8 comprising a hollow cylindrical shell 9 and a spool 10 shaped as a rod. The slide-valve air distributor 8 is substantially a means for communicating the output elements with an evacuating means or the atmosphere. Provided in the hollow cylindrical shell 9 (Figure 2) is an annular chamber 11 connected via a pipeline 12 (Figure 1) to a main vacuum-line 13 coupled to an evacuating means (not shown). Also provided in the shell 9 (Figure 2) is an annular

the atmosphere. Made in the upper portion of the spool 10 is a passage 16 provided, in the lower portion of its wall, with an opening 17. The upper portion of the passage 16 is terminated with an union 18 connected via a hose 19 (Figure 1) to an output element shaped as a pneumatic valve 20. The pneumatic valve 20 comprises a casing 21 accommodating a diaphragm 22 dividing the interior of the casing 21 into a power chamber 23 and a control chamber 24. The hose 19 is connected to the power chamber 23. Secured to the diaphragm 22 is a valve 25 intended to cut off a duct 26 connected to the main vacuum-line 13. The control chamber communicates with the atmosphere through an orifice 27 and with two output elements via a pipeline 28, one of the output elements being shaped as a pneumatic cylinder 29 with its plunger 30 coupled to a milking manipulator 31, and the other, as a pneumatically actuated member 32 arranged on a milk-supplying elastic hose 33. Provided in the upper portion of the spool 10 (Figure 2) is a passage 34 having an opening 35 in the lower portion of its wall. The upper portion of the passage 34 is terminated with an union 36 connected via a hose 37 (Figure 1) to an output element shaped as a pneumatic cylinder 38 mounted on the milking manipulator 31. Hinged to the upper portion of the housing 2 (Figure 2) of the milk flow sensor 1 is a self-collapsible dog 39 co-operative with a clamp 40 secured on the spool 10. Disposed in the housing 2 of the milk flow sensor 1 are unions 41, 42, and 43. The union 41 is mounted under the gauged aperture 4 and is connected via a pipeline 44 (Figure 1) to a main milk line 45. The union 42 is mounted in the upper portion of the housing 2 and is connected via a pipeline 46 to the main milk line 45. The union 43 is also mounted in the upper portion of the housing 2 and is coupled via the elastic hose 33 to a milking apparatus 47 attached to the milking manipulator 31.

Referring now to Figure 2, there is shown the milk flow sensor 1 equipped with the slide-valve air distributor 8, as in the beginning of milking. The float 5 is therewith found in its lowermost position and the end portion 7 of the needle 6 is placed, with its swelled section, in the gauged aperture 4. The spool 10 is stopped in the uppermost position by means of the self-collapsible dog 39 co-operating with the clamp 40. In this position, the passages 16 and 34 of the spool 10 communicate with the atmosphere through the openings 17 and 35, respectively.

Referring to Figure 3, there is shown the milk flow sensor 1 equipped with the slide-valve air distributor 8, as when the cow gives a full flow of milk. The float 5 is therewith found in the uppermost position and co-operates with the spool 10. In this position, the passages 16 and 34 of the spool 10 communicate with the atmosphere and the dog 39 and the clamp are disengaged. The end portion 7 of the needle 6 is located, with its thin section, in the gauged aperture 4.

Referring now to Figure 4, there is shown the milk flow sensor 1 equipped with the slide-valve air distributor 8, as when the cow gives a reduced flow of milk. The float 5 is therewith found in an intermediate position and co-operates with the spool 10. In this position, its passage 16 communicates with the atmosphere and the passage 34 communicate with the annular chamber 11. The end portion 7 of the needle 6 enters, with its swelled section, the gauged aperture 4.

Figure 5 shows the milk flow sensor 1 equipped with the slide-valve air distributor 8, as when the cow ceases to give milk. The float 5 is therewith found in the lowermost position and co-operates with the spoool 10. In this position, its passage 16 communicates with the annular chamber 11 and the passage 34 communicates with the annular chamber 14. The end portion 7 of the needle 6 is disposed, with its swelled section, in the gauged aperture 4.

Referring to Figure 6, there is shown the milk flow sensor 1 equipped with the slide-valve air distributor 8 made according to another embodiment. In this embodiment, the slide-valve air distributor 8 comprises the hollow cylindrical shell 9, in the wall of which there are provided an opening 48 communicating the interior of the shell 9 with the atmosphere, an opening 49 with an union 50 intended for connection of the hose 19, an opening 51 with an union 52 intended for connection of the hose 37, and an opening 53 with an union 54 for connection of the pipeline 12. The spool 10 has annular recesses 55 and 56 for communication of the openings 48 and 49, 51 and 53 with each other.

Referring to Figure 7, there is shown the milk flow sensor 1 provided with the slide-valve air distributor 8 of still another embodiment. In this embodiment, the slide-valve air distributor 8 comprises a vertically fixed plate 57 provided with a through passage 58 for communication with the hose 19, and a passage 59 for communication with the hose 37. Adjoined to the plate 57 with its one side is a plane spool 60 pivotally mounted on the plate 57 with the aid of a hinge 61 and provided with a groove 62 which is in communication with an union 63 for connection of the hose 12. Provided in the loose end of the plane spool 60 is a through slot receiving an end 64 of a rod 65 secured to the float 5.

Referring to Figure 8, there is shown the milk flow sensor 1 having modified needle 6 and float 5. The needle 6 is provided with an inner cavity 66 communicated with a tube 67 passing through the body of the float 5. Mounted on the upper portion of the float 5 is a dog 68 co-operative with the spool 10. The modified needle 6 and float 5 can be used in a ny of the above described embodiments of the slide-valve air distributor 8.

The device operates as follows. Prior to milking, the spool 10 (Figure 1) is lifted by hand and is fixed with the aid of the self-collapsible dog 39 co-operating with the clamp 40 mounted on the slider 10, in its uppermost position. The spool 10 doesn't therewith co-operate with the float 5 located in the bottom portion of the float chamber 3. The opening 17 (Figure 2) of the passage 16 of the spool 10 communicates with the atmosphere and the air, through the opening 17, passage 16, union 18, and hose 19, enters the power chamber 23 (Figure 1) of the pneumatic valve 20. The diaphragm 22 is sagged and the valve 25 cuts off the duct 26 thus separating the control chamber 24 from the evacuating means.

The air, via the orifice 27, enters the control chamber 24 and then, via the pipeline 28, the pneumatically actuated member 32. The pneumatically actuated member 32 releases the elastic milk-supplying hose 33. At the same time, the air, entering via the pipeline 28 the pneumatic cylinder 29, releases the latter, thereby making it possible to rotate the milking manipulator to a required position. The opening 35 (Figure 2) of the passage 34 of the spool 10 therewith communicates with the atmosphere, and the air, via the openings 35, passage 34, union 36, and hose 37 enters the pneumatic cylinder 38 mounted on the milking manipulator 31 (Figure 1) and cuts it off. Then the milking apparatus 47 with the aid of the milking manipulator 31, is brought under the cow udder and the teat cup cluster is fitted thereto. The milk from the milking apparatus 47 is forwarded via the elastic milk-supplying hose 33 into the float chamber 3 of the milk flow sensor 1. From the float chamber 3 the milk, through the gauged aperture 4 and the pipeline 44 enters the main milkline 45. Some of milk which has no time to flow away through the gauged aperture 4 fills the float chamber 3. As the cow gives more milk, the milk level in the float chamber 3 (Figure 3) rises, whereby the float 5 goes upwards and lifts the spool 10. The clamp 40 mounted on the spool 10 releases the self-collpasible dog 39 that is collapsed by gravity. During this period of the milking, the bulk of the milk entering the float chamber 3 (Figure 1) is sucked from it through the duct 42 and enters via the pipeline 46 the main milk line 45. Only a little of the milk therewith flows away through the gauged aperture 4 wherein the lower section of the end portion 7 of the needle 6 is disposed. Variations of the milk level in the float chamber 3 cause vertical movements of the float 5 together with the needle 6, which contributes to the cleaning of the gauged aperture 4 of milk-borne fats and salts deposited on the edges thereof. By the end of the milking, when the cow no longer gives a sufficient quantity of milk, all the milk entering the float chamber 3 (Figure 4) has time to flow away through the gauged aperture 4, the float 5 lowers to assume an intermediate position and the spool 10 does so by gravity. As the spool 10 lowers, the opening 35 of the passage 34 enters the annular chamber 11 communicated with the evacuating means via the pipeline 12. This results in the communication of the pneumatic cylinder 38 with the evacuating means via the pipeline 37, union 36, passage 34, and opening 35. Once evacuated, the pneumatic cylinder 38 draws the milking apparatus 47 downward to complete the milking mechanically. At the same time, the upper section of the end portion 7 of the needle 6, greater in cross-section area than the lower one, enters the gauged aperture 4 thus decreasing its cross-sectional area. As a result of the mechanical completion of the milking, the cow can give an increased quantity of milk for a time, which causes a rise of the float 5, whereby the swelled section of the end portion 7 of the needle 6 leaves the gauged aperture 4, thus increasing its cross-sectional area. Such an automatic adjustment of the milk flow rate through the gauged aperture 4 makes it possible to dispense with the becomes empty. The swelled section is required to prolong the mechanical completion of the milking for the milk flows away from the float chamber 3 at a lower rate than the retardation of the float sinking occurs. As the cow gives a further decreased quantity of milk, the milk supply to the float chamber is also decreased and the float 5 (Figure 5) goes down to the lowermost position, the spool 10 of the air distributor 8 therewith also sinks. With the sinking of the spool 10, the opening 35 of the passage 34 enters the annual cavity 14 communicated with the atmosphere via the opening 15. This results in the communication of the pneumatic cylinder 3 (Figure 1) with the atmosphere via the hose 37, union 36 (Figure 5), passage 34, and opening 35. The pneumatic cylinder 38 therewith ceases to draw the milking apparatus downward. At the same instant when the opening 35 enters the annular cavity 14, the opening 17 of the passage 16 enters the annular chamber 11 communicated with the evacuating means via the pipeline 12. This results in the communication of the power chamber 23 (Figure 1) of the pneumatic valve 20 with the evacuating means via the hose 19, union 18, passage 16, and opening 17. The diaphragm 22 of the pneumatic valve 20 therewith comes into its straightened position and the valve 25 opens the duct 26 thus communicating the control chamber 24 with the evacuating means. The pneumatically actuated member 32 and pneumatic cylinder 29 connected with the control chamber 24 via the pipeline 28 are also brought in the communication with the evacuating means. Once evacuated, the pneumatically actuated member 32 clips the elastic milk-supplying hose 33 thus cutting off the milking apparatus 47. Under vacuum, the pneumatic cylinder 29 comes into action which causes the milking manipulator 31 to rotate and swing the milking apparatus 47 from under the cow udder.

When equipped with the slide-valve air distributor 8 shown in Figure 6 the device operates in the same way as described above, except that the power chamber 23 of the pneumatic valve 20 connected through the hose 19 with the uniton 50 secured on the shell 9 of the slide-valve air distributor 8, and the pneumatic cylinder 38 connected via the hose 37 with the union 52 are brought into communication with the atmosphere via the opening 48 in the shell 9 and the annular recess 56 on the spool 10, and with the evacuating means, via the union 54, opening 53 in the shell 9, and annular recess 55.

When equipped with the slide-valve distributor 8 shown in Figure 7 the device operates as described above, except that the plane spool 60, when rotating about the axis of the hinge 61, communicates the passages 59 and 58 connected respectively the pneumatic cylinder 38 and power chamber 23 of the pneumatic valve 20 via the hoses 37 and 19 with either the evacuating means or atmosphere.

When equipped with the needle and float shown in Figure 8 the device operates in an analogous way to that described above, except that as the cow gives a full flow of milk, the milk filling the float chamber 3 is forwarded to the main milk line 45 via the tube 67, inner cavity 66 of the needle 6, and pipeline 44. This

union 42 and pipeline 46.

It will be understood for those skilled in the art that the preferred embodiments disclosed above permit to solve the principle object of the present invention which lie within the scope of the appended claims. It should be also apparent that minor changes in the construction of the milking control device may be made without departing from the spirit of the invention. All these changes will be considered to remain within the limites of the spirit and scope of the invention set forth in the claims.

The present invention exhibits a high reliability, has a rather simple design, and cuts the labour consumption to a minimum.

CLAIMS

1. A milking control device comprising output elements controlling, a milking apparatus, a milk flow sensor having a closed housing accommodating a float chamber provided, in its bottom portion, with an outflow aperture, and a float placed within this chamber, a means for communicating the output elements with an evacuating means or the atmosphere and capable of co-operating with the sensor, characterized in that the outflow aperture is made gauged, a needle of variable cross-section is secured on the bottom portion of the float, the needle having its end portion disposed in the outflow aperture, and the means for communicating the output elements with the evaucating means or atmosphere is shaped as a slide-valve air distributor mounted on the upper portion of the milk flow sensor housing, the spool of the air distributor being capable of co-operating with the float of said sensor.

2. A milking control device as claimed in claim 1, characterized in that the slide-valve air distributor comprises a hollow cylindrical shell provided with annular chambers, one of which communicates with the evacuating means and the other, with the atmosphere, and a spool shaped as a rod having, in its upper portion, longitudinal passages to communicate the annular chambers of the shell with the output elements.

3. A milking control device as claimed in claim 1, characterized in that the slide-valve air distributor comprises a hollow cylindrical shell provided with a group of openings made in the shell wall and located at different levels, the lowermost opening communicating the shell interior with the atmosphere, the uppermost one, with the evacuating means, and the rest, with the output elements, and a spool shaped as a rod provided with annular recesses to communicate the openings in the shell with each other.

4. A milking control device as claimed in Claim 1, characterized in that the slide-valve air distributor comprises a vertically fixed plate provided with a through passages communicated with the output elements, and a plane spool adjoining with its one side to the plate where it has a groove communicated with the evaucating means, the spool being pivoted with its one end to this plate, and with the other, to a rod secured on the float of the milk flow sensor.

5. A milking control device as claimed in any of Claims 1 to 4, characterized in that the needle is made hollow and open-ended, the upper end communicating with a tube passing through the float body.

6. A milking control device as claimed in any of Claims 1 to 5, characterized in that is is provided with a self-collapsible dog to fix the spool in the uppermost position, the dog being cooperative with a clamp attached to the spool.

7. A milking control device substantially as herein described with reference to the accompanying drawings.

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